Forward jet resolution study Aug 2, fsPHENIX biweekly meeting

- **Status of the study**
  - No progress yet since last update (Aug. 9). I'll try to make some until next meeting
  - Issues in last update:

    1. Definition of leading jets – highest energy or p_T
    2. Weird results when tried by PYTHIA6. Basic level check needed
    3. Test $\sqrt{s}$ = 510 GeV in addition to 200 GeV

- **In this report**
  - Goal of the study (overview for the members after transition to topical Cold QCD meeting)
  - Methods and Variables
  - Status and Problems

Goal

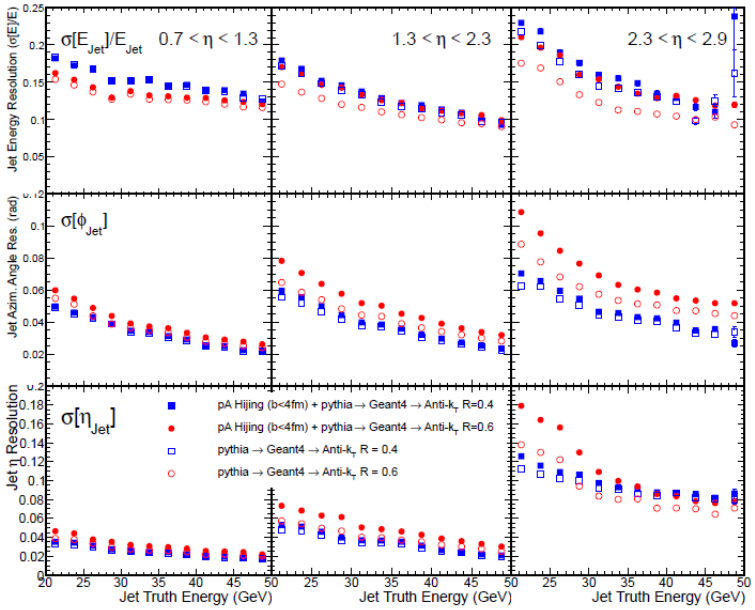


Figure A.2: The GEANT4 simulated jet resolution of single jets for energy (top row), ϕ (middle row) and η (bottom row) in $p+p$ (open markers) and $p+A$ (closed markers) collisions reconstructed with the FASTJET anti-k_T algorithm with $R = 0.4$ (blue) and $R = 0.6$ (red).

sPHENIX proposal
pA (HIJING) / pp (PYTHIA8)

- **Study resolution of forward jets using forward calorimeters**
  - p + p events by using PYTHIA8 or PYTHIA6 (tune A), either √s = 200 or 510 (GeV)
  - Get truth jets using existing jet reco algorithm, then select $1^{st}/2^{nd}$ leading jets by energy or p_T
  - Evaluate resolution of desired parameter,

    but for now I plan to use e_reco / e_true only until general sanity settles down

Methods and Variables

- **Procedures:**

  1. Generate events using Pythia8 (Pythia6) + Geant4 simulation + Jet evaluator

     (used default setup in *Fun4All_G4_fsPHENIX.C*, framework build pulled in July 21)

  2. Evaluate truth jets, then search $1^{st}/2^{nd}$ leading jets (highest/2^{nd} highest p_T) in an event

  3. Fill target parameter (ex. e_reco/e_true) for given condition (below) into a TH1

  4. Get resolution of the parameter

- **Conditions**

  – Pythia8 or Pythia6 tune A

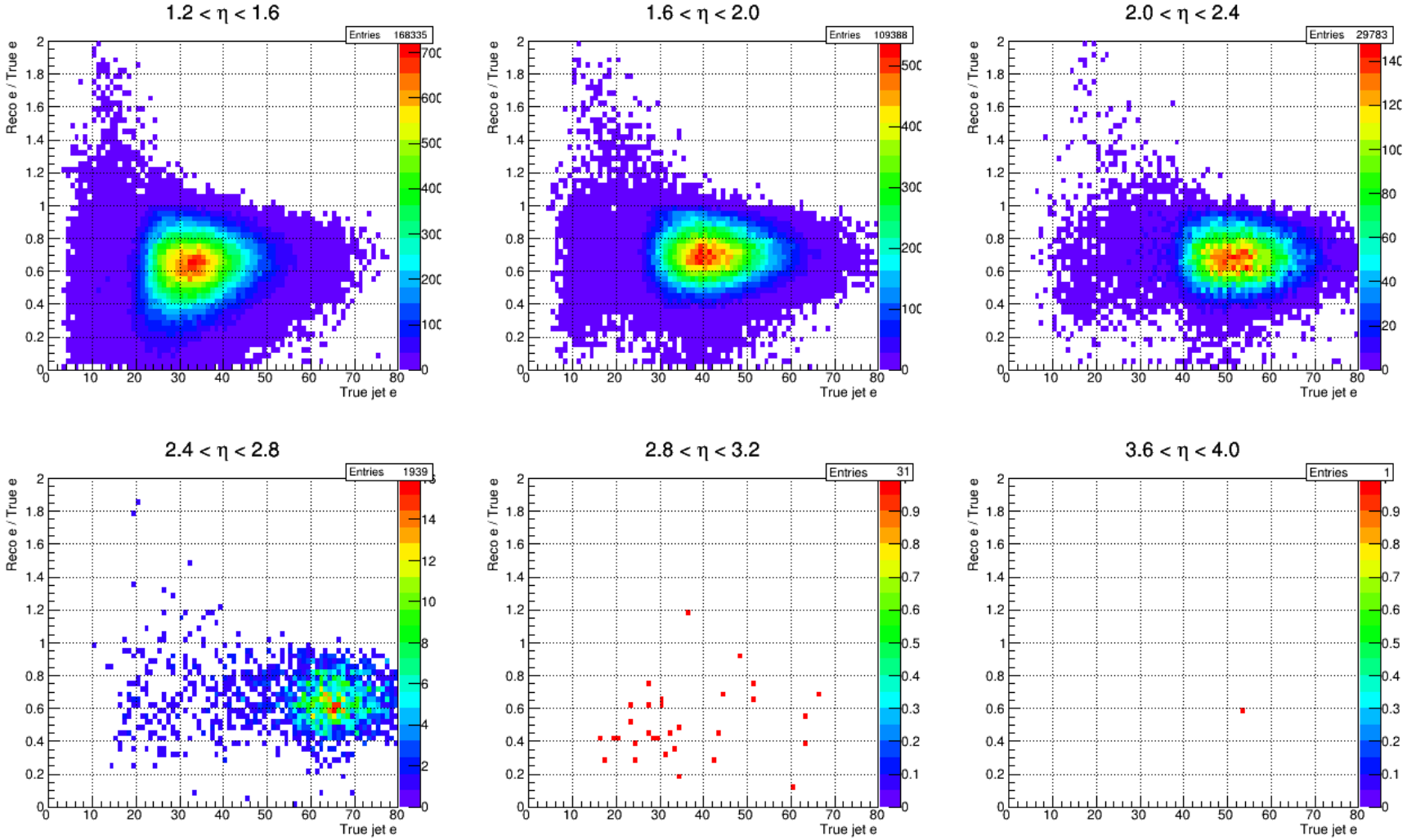
  – Use truth jet (reconstructed based on particle level, NOT tower)

  – True η windows: {1.2, 1.6, 2.0, 2.4, 2.8, 3.2, 3.6, 4.0}

  – True energy windows: {20, 22, 24, 26, 28, 30, 34, 38, 42, 46, 50, 60, 70, 100}

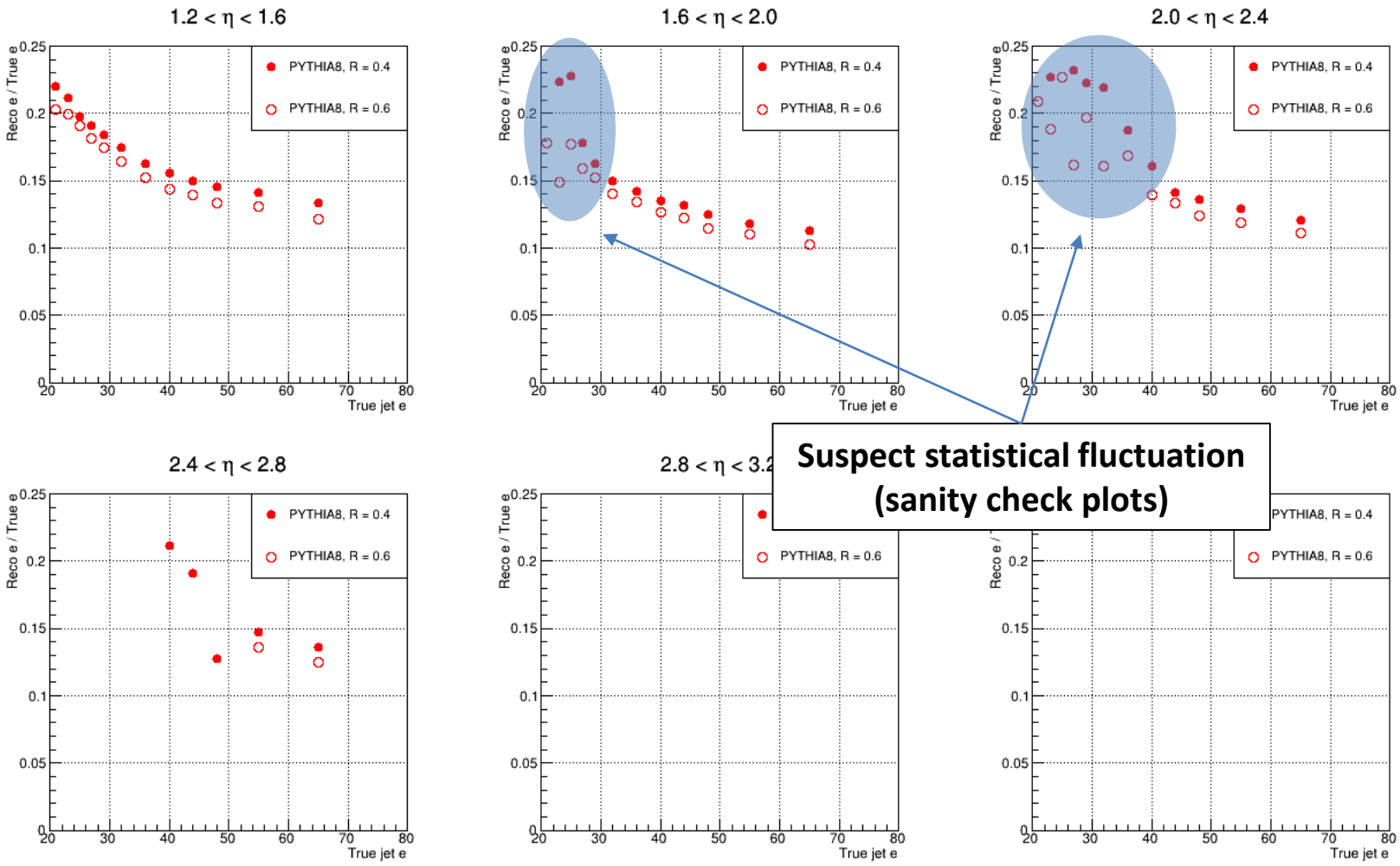
Pythia8 sanity check

Anti k_T R = 0.4



– Reco e / True e vs. True e, 0.3 M generated, 1st/2nd leading jets by p_T only

Pythia8 e_reco/e_true RMS of a filled TH1



Reco E / True E vs. True E **(* Caveat: x axis begins from 20)**

Summary

- **Status and Overview of the study**
  - Forward jet resolution study, for now deal with only e_reco/e_true

    → I'll evaluate actual resolution once current sanity problem is settled down
  - In general results by Pythia8 has no major problem but Pythia6 has

- **To do**
  - I'll give you an update in next meeting for following items, at least:

    for Pythia8,

    a. effect of find leading jets by e or p_T

    b. effect of √s = 200 or 510 (GeV)
  - For Pythia6's general sanity I'll try to put it on right way, but I cannot promise